IN THE UNITED STATES DISTRICT COURT

FOR THE WESTERN DISTRICT OF PENNSYLVANIA

OTTO E. PRITCHARD,
Plaintiff,

vs.

LIGGETT & MYERS TOBACCO COMPANY,
Defendant.

Civil Action No. 12820

AFTERNOON SESSION

PROCEEDINGS OF THURSDAY, APRIL 28, 1960

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this witness.

MR. McARDLE: NO objection.

THE COURT: It will be admitted.

MR. McARDLE: Put it in.

(Thereupon, Defendant's Exhibit No. 4 was admitted in evidence.)

MR. JACKSON: That is all.

THE COURT: That is all, Mrs. Meyer.

THE WITNESS: Fine. Thank you.

- - -

MR. EMAS: Dr. Wright, please.

GEORGE F. WRIGHT, a witness in behalf of the defendant, having been duly sworn, testified as follows:

THE CLERK: Your full name, sir, for the record.

THE WITNESS: George F. Wright.

THE CLERK: Thank you, sir.

DIRECT EXAMINATION

BY MR. EMAS:

Q Would you state your name, please, Dr. Wright?

A George F. Wright.

Q And your residence?

A Toronto, Ontario.

Q Would you state what your present position is, your occupation?

A Professor of Chemistry, University of Toronto.

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Q Will you tell His Honor and the Jury your educational background?

A I obtained my Bachelor of Science Degree in 1932 at Iowa State University, and my -- no, I am sorry. My MA in 1929 or BSC in 1929, and my PhD degree in 1932 at the same institution.

Q And did you also serve at a later occasion as a Rockefeller fellow?

A Yes. I won a Rockefeller research fellowship.

Q In chemistry?

A In chemistry.

Q Will you state what professional societies, if any, that you happen to be a member of?

A Well, I am a member of the Society of Sigma Xi, and the American Chemical Society, American Crystalographic Association, the British Chemical Society.

I am a fellow of the Royal Society of Canada, and a fellow of the Chemical Insitute of Canada.

Isn't that enough?

Q I think that suffices, Doctor.

Do you serve in any consultant capacity in your field of chemistry?

A Yes. I have consulted for the Department of National Defense of Canada for many years.

Q What was the nature of your work in that respect?

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6 A Research on explosives and on combustion in general.

Q And were you given any award in connection with your work in that capacity?

A Well, the American Government gave me an award, the Medal of Freedom, and the British Commonwealth gave me the membership in the Order of the British Empire.

Q Commonly known as the CBE, is it not?

A Yes.

Q Do you serve in any other consultant capacities in addition?

A Yes. I have been consulting for a good many years for the Tennessee Eastman Company on chemical and -- general chemical problems, and I am consulting for the Imperial Tobacco Company for the last few years.

Q That is a Canadian corporation engaged in the manufacture of tobacco products?

A Correct, yes, and then, of course, from time to time, as people are desirous of information, I consult on other matters, maybe 10 or 12 a year, something of that sort.

Q Now, can you tell us whether or not the University of Toronto has been awarded grants from Canadian Cancer Institute for work to be conducted under your supervision in your laboratory?

A Yes, since about 1955, I believe, the Canadian

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Cancer Institute has given me yearly grants for work of interest in connection with the tobacco field.

Q Couldyou state whether you have published articles in the general field of chemistry, and if so, about how many? I am not confining this to tobacco chemistry.

A Oh, there must be about 250. It was 230 or so a couple of years ago.

Q Do you hold yourself out to be an expert in the field of statistics?

A No.

Q Or epidemiology?

A Oh, no.

Q Or as a medical doctor? Obviously no.

A No.

Q Have you ever done any work in connection with the chemical composition of cigarette smoke condensate?

A Yes.

Q In collaboration with whom, if you will?

A Well, I suppose principally in collaboration with the students and post-doctoral fellows that come to my laboratories, and outside with Dr. Wynder of the Sloan-Kettering Institute, and with Dr. J. P. H. Gilman at the Ontario Veterinary College. I think that is --

Q When did this work dealing with the chemistry of cigarette smoke condensate commence as far as you were

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concerned?

A In 1954, I believe.

Q Now, are you still concerned with the same problem?

A Yes. We are still working on it.

Q Now, a witness for the plaintiff in this case, by the name of Dr. Kendall, has testified that he was employed by the Lorillard Tobacco Company, to identify chemical components in tobacco smoke, but that he never determined the quantity present.

Could you tell the Court and the Jury what value the identification of chemical substances in cigarette tobacco smoke or condensate has in the absence of any determination as to the amount present?

A Well, --

THE COURT: Just one moment, Doctor. Would you read that question to me again?

(Question was read.)

MR. HAAS: Did you hear me, Doctor?

THE WITNESS: Not too well, sir. My hearing is not too good.

MR. HAAS: I am sorry.

THE COURT: Perhaps you better come up forward, Mr. Haas.

MR. HAAS: Sorry, Your Honor.

BY MR. HAAS:

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Q Did you hear the reporter repeat the question?

A Yes. Thank you.

Q Well, can you answer the question as phrased?

A Well, it wasn't the difficulty in hearing the question; it is a little difficult to answer it. It has to do with the nature of the spectroscopic analyses, that I understand that Dr. Kendall was using, from my reading of his testimony.

Q That's right. He has testified that he used infra-red spectroscopy in the identification of polynuclear aromatic hydrocarbons which he said -- and I quote -- was "the most potent analytical tool available."

Now, have you used that type of infra-red spectroscopy in your studies at all?

A Well, I have used -- I do research in infra-red spectroscopy. I can answer that part of the question.

Q Well, can you state whether you have an opinion as to the value of the use of this infra-red spectroscopy in the identification of polynuclear aromatic hydrocarbons in tobacco smoke or its condensate?

A Well, actually, from the type of substance for which we are seeking, in the sense that that is what we know we can have a chance to find at this time, the infra-red region is not the best region, that is to say, for the polynuclear aromatic compounds. It is not the best spectral

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10 region.

SG:10 Q Have you used other spectral methods than the infra-red method?

A Yes, we have used ultra-violet spectroscopy and fluorescent spectroscopy as well.

Q Do you find that either or both of the latter systems that you mentioned -- I withdraw that.

Did you find these other methods superior or inferior to the infra-red method in the identification of these hydrocarbons?

A For polynuclear aromatics we find that the ultra-violet region, either by absorption or by fluorescent spectroscopy, is preferable to the infra-red. This is because of the nature of themolecule. It wouldn't be true for some other type of molecule.

MR. HAAS: If Your Honor please, I think if we could use the blackboard, the doctor might be able to give a demonstration of how spectroscopy works. I think it's a rather complicated thing, and perhaps he can make more sens out of it than I can in phrasing my questions.

Would Your Honor object to that?

THE COURT: No. We can have a blackboard brough out.

(Blackboard set up.)

BY MR. HAAS:

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Q Doctor, would you care to step down and describe on the blackboard the method of spectroscopy, and if you will, confine it to the use of the infra-red system which Dr. Kendall utilized in the examination of the particulate phase of this smoke.

A Well, in the first place, I want it to be recognized that I can't give a rigorous explanation of spectroscopy in the short time that I have here.

I would like, however, to do so firstly because there is an unanswered part of a question with respect to mixtures, and I am afraid that if I don't answer that now, I will be confusing people later.

So if you would allow me to give in general the idea of the spectroscopic method as we use it, and then bring in the significance of the ultra-violet versus the infra-red, why, I believe this is the best way that I could handle it, with your permission.

Q You may proceed.

A As I say, this can't be a rigorous scientific study, and I myself could find errors in what I am going to say. But essentially what I would try to tell you is the method which we use, and why it isn't very satisfactory when one has mixtures.

If we consider a region of the spectrum -- let's talk about something that we all know, the visible region wher

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we use our eye as a detector, and we could call this red and green, let us say, and blue, now, the way that one measures color, of course, is by the depth of color, or the intensity. So we will say that we are talking about depths of color here. And we are talking about this visible region where our eye is the detector.

Actually, of course, this is only a small part of the spectral range that we use, and out in this region is what we call the ultra or above violet, and down here is the region we call the infra or below the red.

But let's concentrate on this region here first. We can say -- well, let's say we had a substance and it's colored, and I'll put that in here as sort of a hump or mountain for the purposes of this discussion, and we will say that represents a red compound that is maybe a little bit toward the green. Now, another substance will have another color. Let's put it here, a green substance. And then we have got other things. We can think of other things that would go in here and here is one greenish red -- a reddish green, here is a greenish red, these are all perhaps different heights.

Now, these colors, as you know if you are mixing paints, these colors are added, and so actually the color that you would see as you accumulate these would be -- over-

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all it would have some color that would appear a blend up in here.

We have several colors in our clothes, but they blend to give the color that one actually sees.

Now, that's what it would represent if he would actually see with his eye or the detector in any of these regions if he had a mixture.

Now, one is always trying to push his experimental equipment farther than it will go. This is characteristic, I would say, of scientists. And he is looking for something, you see, and he happens to have a substance which is green, and he has this substance pure, and he knows that this is green. Now, there is a great temptation, and there is always a probability that that peak up there might be this green. But it also could not be. And I have tried by this method to show you how. An analysis of mixtures can be very dangerous. It can be only something that is worthwhile as a first very vague guess.

Then what we do, of course, is take this apart and separate these things, and once we got that where each one of them is separate, then we can get its typical color or absorption, as we call it.

The infra-red is quite as good a region, and the infra-red region we use to study the vibration of the atoms in substances.

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In the ultra-violet region, it's also a very good region, we study the motions of electrons in this region.

It so happens that in polynuclear aromatics, because of the nature, the flat nature, if you please, of the molecules, that electronic vibrations are the most important, and that is the reason we use it up there.

Now, that is what I have tried to give you with respect to what the spectral analysis is.

Your other question, I believe, involved -- well, perhaps you had better state it.

Q Doctor, I would like to ask you this:

I asked Dr. Kendall the following question, at page 707 of the record:

"Now, do I understand from your testimony that in your analysis in smoking Chesterfield cigarettes that you did not concern yourself with the condensate?

"Answer: That is correct. I examined the -- as I explained this morning, the vapor phase or theliquid particulate phase which was before that had settled out in a one meter infra-red gas cell."

And then I said:

"Question: Do you consider this to be a classic manner in making that analysis?"

And he answered, "This was a new and novel approach

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which was most rewarding in the results obtained from it.

Now, do you gather from the doctor's testimony that he made any separation of the various elements that were contained in the particulate phase of the smoke as he examined it spectroscopically?

A Well, as I understand that testimony, he drew in a mouthful or a lungful of smoke and blew it into the absorption cell. Under those circumstances, he most definitely didn't have any separation. In fact, he was evidently trying to avoid this. This means he got a very wide mixture. But one can always learn.

However, certainly in my experience in my laboratory, I would think not only from my experimental work, but also from the fundamental principles of physics, that this would be a very questionable scheme entirely. You see, I haven't told you one characteristic, one that one must have in these spectra, one must be examining a particle which is short or smaller than the wave length of light that is involved. And, of course, green, red, red-green, blue or any other color represents a different wave length.

Now, in the infra-red region the wave lengths are one to 15 -- in the range that Dr. Kendall, I presume, was using -- well, I know he was using this range -- one to 15 millionths of a centimeter. That is pretty short. But this is about the size, or at least covers the range or size of

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the particles in the smoke.

Therefore, these smoke particles will scatter light, and one would have the same difficulty in seeing through it as if he were looking through a fog.

It's not exactly analogous, but it's very close to the same thing.

So that I would think he would only see a peak among this very rough mountain range only if he were looking for it. I don't think under these circumstances -- there is another factor in here, let us say he did this trick, let us say he let this settle a little bit so that all the big pieces settled out, and that was left was below one micron -- and this is reasonable, the course particles drop out first, and the fine ones later. Then we know the fine particles contain so little of the total weight of the smoke, then he wouldn't have enough material left in order to actually represent a depth of color in order to read.

I don't contradict it, but it doesn't seem -- in my laboratory that thing wouldn't work.

Q Doctor, this is not the system that you use; is that correct?

A I have tried this sort of thing and it doesn't work.

Q Now, Doctor, have you in your work made any attempt to separate out from the smoke condensate -- and I gather this is what you have used, and not just the smoke

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itself; is that correct?

A That's correct.

Q Have you made any attempt to separate from this conglomerate mixture any particular phase insofar as a given aromatic hydrocarbon is concerned?

A Yes, sir, yes. This is our method.

Q Will you explain briefly to the jury how you go about this?

A Well, it was lucky that the interest in this came along just about as our techniques were being -- that new techniques were brought in, and we adapted these techniques to the work, because other, older methods wouldn't be effective. The methods that we use go under the general classification of chromatography. And it is relatively simple the way it is done, except it was a little slower getting the thing going.

You take a glass tube -- it doesn't always have to be glass, but you can see through glass, at least -- and close it down at the bottom like this (indicating), and put a little bit of glass wool in here. And then we fill this up quite carefully with a mineral. I call it a mineral because there are a number of them.

Then we take the tobacco smoke condensate and put it on the top here, the tobacco smoke condensate. And we will then add a solvent such as -- the first one here essentially

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is gasoline. That is the one one we use.

And as this passed down, the mineral has the property of holding on to the chemical substances, but also it has the property of holding on to some substances more than others. So that if one, say, is dragging or sweeping things down here, the mineral will let go of some things quicker than others, and as a consequence, one then will have bands, as we call them, one advancing faster than the other. And our usual way is to keep passing this down, and as this band comes out the bottom, we separate that, and then another one, and another one.

I am not trying to imply that we get perfect separations here, but one can repeat this process again and again, and after he has done it enough times, why, then, he can get a thorough approximation of a single compound.

Frequently we turn to another type of chromatography--

Q Paper chromatography?

A Paper chromatography, to do this.

Q This is used as a supplement to the column method that you have already mentioned, Doctor?

A Well, one can handle a mass of stuff. For example, I have columns so large I can handle about two ounces. Maybe that doesn't seem very much to you, but it is quite a bit on one of these things, two ounces of material.

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When I get to a piece of paper which is about like a piece of blotting paper, it can only handle a very small fraction of an ounce. So I will make my, we call it a gross separation on here at first, and then take each one of these individually after I have refined them several more times, and put them on paper. And one does this if one takes one of these fractions and evaporates it down where there is just a pinpoint of material left, we will say he will then spot that on the paper in this manner. He may have a series of them across here, but he will spot one of them on here at a time.

There are two methods -- I will describe the ascending method -- he puts this paper into a liquid down here, and the blotting paper tends to soak that up. And as it soaks up, again it drags the material in front of it, but it drags one thing more than another, so that this spot will finally be resolved into -- it's pretty concentrated down here, you see, into spots up here. Maybe we know what this thing -- rather, guess as to what this thing is. Maybe we say, "I'll bet you that's benzpyrene," so we will put a spot of benzpyrene on here. Of course, it's pure, and sure enough, we will say, "Yes, it is benzpyrene in this thing."

Also, there are three other things, I have to guess what those are. At any rate, we wouldn't just identify it by this so-called RF value, as we call it, but we would also

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take a pair of scissors and cut that spot out, extract the material out of it, and it is almost pure then, very close to being pure, determine its spectrum, and if it shows the proper range of color as we are putting it in those terms, then this is identification for the substance.

That is essentially the story. Is that satisfactory?

Q It helped me Doctor.

MR. HAAS: Do you have any questions, your Honor?

BY MR. HAAS:

Q Dr. Kendall testified that the first person to identify 3:4 benzpyrene in tobacco smoke condensate was a gentleman by the name of Roffo --

A Maybe we can leave that up there for a minute (indicating blackboard).

THE COURT: Leave the blackboard up, will you, please?

THE WITNESS: I just want it in connection with this questin.

MR.HAAS: Will you read the question thus far, please, Mr. Gantverg?

(Question thus far read by the reporter.)

BY MR. HAAS:

Q -- in South America in the year 1939. Are you familiar with Roffo's work?

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A Yes.

Q Is it accepted, if you know, in the field of tobacco chemistry that Roffo actually identified 3:40 benzpyrene?

MR. McARDLE: I think this witness, if the Court please, could be limited to what he thinks, not what is accepted in the field of chemistry.

MR. HAAS: I will accept that, Mr. McArdle.

BY MR. HAAS:

Q Do you accept that Roffo actually identified 3:4 benzpyrene in 1939?

A Well, without any disparagement of Roffo, I would point out that on the basis of his analysis, and if you will examine the work, you will find his separation was far from extensive; that he would be getting these mixtures, and what he saw might be benzpyrene, or it might not. But from the standpoint of identifying, you would put a very heavy tentative in front of it, so tentative that it would put the rest of us to work -- if Roffo had the answer, I guess we wouldn't have spent all the money we spent continuing the operation.

Q Do you know whether or not Dr. Roffo's experiment was comparable to the analysis of cigarette smoke condensate?

A Well, actually, of course, he wasn't using smoked tobacco, as we know it. He was using what we might describe

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as toasted tobacco. That is, he heated it at about 120 degrees for a number of days, and then he distilled off from this. It wasn't a burning process in the sense of oxygen being consumed. And certainly this is not comparable with--

Q Modern techniques?

A It certainly could not be defined as tobacco smoke condensate.

Q Do you know whether anyone subsequent to 1939 attempted to duplicate Roffo's work?

A I believe that this Japanese fellow at Sloan-Kettering.

Q Sugiura?

A Sugiura, wasn't able to repeat it.

Q Can you tell us when 3:4 benzpyrene was first positively identified in cigarette smoke condensate?

A Well, these things are always gradual. It's hard. Up until 1954 Dr. Pfeiffer, who I suppose knows more about polynuclear aromatics than anybody else in the United States, couldn't find it, but in that year Lindsay in England, that is at Bartholemew's College, got a very good spectrum. In other words, Lindsay did this sort of thing I am talking about. He got a very good spectrum, and one which I would say was acceptable to us.

Q In about what year was this?

A I think that was 1954.

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MM:11

Q Yes.

A Then we would be working on this, of course, but we, in about a year later, I would say it was, isolated the pure benzpyrene, pure 3:4 benzpyrene, and ~~this other is all degrees of identification.~~

I would give credit to Lindsay, but it was very satisfying to Lindsay when we got the stuff out in the hand.

Q Now, could you tell us what the nature of your experiment was that wound up with the isolation of some 3:4 benzpyrene in about 1955?

How did you go about it?

A Well, we certainly hammered a mosquito with a sledge. There was no question about that. We had to use about 3000 pounds of tobacco, cigarette tobacco, which we burned as much as possible in the manner that a cigarette would burn. We then went through these separations of this kind.

Of course, they were very -- there was a great deal of work with this amount of material, because from 3000 pounds, one gets about a hundred and twenty pounds of tar, and then by separations of this kind or some others that we originated, we get this down to about a hundred grams containing the polynuclear aromatics, and then the rest of the separation was this sort of thing, out of which we got

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a crystal of benzpyrene.

Q Expressed in parts per million, how much benzpyrene did you find, 3:4 benzpyrene?

A Now, from a separation of this kind, you understand you can't -- there is a lot of wastage here. I say I got a crystal out, but there was much more than that in there.

However, once we know it is out, then we depend on the spectroscopic method, and this has also gone back and forth. One person add one number and one person add another, but we were able to tie this down in 1959.

From work that I have done, but largely the work of other chemists also that perfected the method by using radioactive carbon, benzpyrene containing radioactive carbon, and this way we can actually get a reliable number for benzpyrene, and it turns out to be about 1.5 parts per million. 15 parts per ten million.

Q Now, how many people collaborated with you in this experiment with 3000 pounds of tobacco, as you recollect?

A Well, as I remember there were four post-doctoral research men and maybe four to six technicians.

Q And how long did the experiment take?

A Oh, 14 to 16 months. I would guess that I wore out one set of post-doctorals and started on another one.

Q Now, Doctor, in a deposition which was taken and read to the jury in this case, Dr. Dankis, Director of

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Research, present Director of Research of Liggett & Myers Tobacco Company, was asked whether he had available prior to December, 1953, molecular distillation equipment for the analysis of cigarette smoke condensate.

Haveyou used this method?

A Well, we tried it, yes.

Q How did it work out?

A Dr. Wynder and I were interested in it at one time.

Q How did it work out?

A It was unsatisfactory.

Q And the same question was asked of Dr. Darkis with respect to ion exchange experiments.

A He tried that one too, and it was a flop.

Q Are you in general familiar, Doctor, with cigarette smoking machines?

A Yes. Yes, I would have to be in order to get cigarette smoke condensate.

Q Can you state whether or not the amount of the condensate that is produced by these machines depends on the type of machine used?

A Yes, it does.

Q And assuming that the machine is a standard one and a good one, can its condensate be equated with the smoke inhaled into the human lung?

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A No, I am afraid not. We tried to come as close as possible, but I have to give that answer.

Q Now, when a substance is said to be carcinogenic, does it mean that it produces cancer in a human being?

A Well, I don't think it is a very good idea to use the term carcinogenic in that way, without modification anyway.

Q Well, how would you modify it?

A Well, just as you talk about several kinds of cancer, you have to talk about cancer on the sites on which cancer occurs, so you have to talk about sites on which these compounds are placed; that is to say skin, and also since cancer isn't the same in different species of mammals, you have to talk about the animal that you are using.

In other words, so far as benzpyrene is concerned, in the work that I was doing, we would talk about a mouse skin carcinogen. You have to do this if you are --

Q Now, you personally planned animal experiments dealing with tobacco smoke condensate.

Do you hear me, Doctor? Have you personally planned animal experiments in which tobacco smoke condensate is used?

A Yes. I had to do this because, of course, this is the end to which our chemical results --

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Q Are aimed?

A — are aimed.

Q Have you in process such experiments at the present time?

A Yes.

Q And have you assessed the results of these animal experiments?

A Some of them. Part of them are not finished.

Q And some of your work has been in collaboration with others?

A Well, of course, I am not, what you would say, a mouse man. I find it necessary to work with people who are skilled in this art.

Of course, I have to plan the experiments with them, because there are chemical aspects which they must apply.

Q Very well. And who have you worked with in this respect?

A Well, I first worked with Dr. Wynder at Sloan-Kettering Institute, and at present I am working with Dr. Gilman at the Toronto Veterinary College.

Q As I understand it, in your work with Dr. Wynder, tobacco tar or the condensate was painted on the backs of certain mice. What type of mouse was selected?

A Wynder used CAF-1 and Swiss mice.

Q Do they have any peculiar characteristic that

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fits them for this type of experiment?

A Well, they are mice that are sufficiently susceptible to polynuclear aromatic hydrocarbons -- this is my interest and choice -- that one can finish an experiment in a reasonable length of time.

Q If you know, what strength of the tobacco condensate was painted on these mice?

A Well, essentially one can say that the pure, the condensate in its concentrated form was placed on the mouse just as much as one could get on in the area, eight centimeters square or eight square centimeters, which is about what you can get on the back of a mouse.

Q And how often were they painted, if you know?

A Three times a week.

Q And for how long -- for how long a period?

A Well, periods of about a year and a half.

Q And what were the results of these experiments, if you can state?

A Well the tobacco smoke condensate would, if it were put on in sufficient amounts, would produce first papillomas, which are, of course, not cancers, at about -- after a duration of about 10 months, 9 months, 10 months, and then from then on if cancers would appear, 11, 12, 14 months, and one would determine the length, the time in which these appeared and the number of them, and from this

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could gauge the carcinogenicity, mouse skin carcinogenicity of the substance. Now, is that a proper description?

Q I think so, sir.

A Checking this, of course, against a substance like -- pure substance that one knew would give mouse skin cancer, such as benzpyrene methylcholanthrene.

Q Well, if you were to use any one of these hydrocarbons, such as 3:4 benzpyrene, in its pure form, crystalline form, on the back of a mouse, what quantity would have to be painted on that mouse to achieve the results you have just stated in comparing it with the amounts of condensate painted on the mouse?

A Well, it is about, I would say, a thousand times as much as we were ever able to find in the tobacco tar of any certain compound. Let us say in this case the only one for which we can definitely speak in quantity, 3:4 benzpyrene. It requires about a thousand times as much to produce cancers on mice in the same length of time.

Q Do you know what is in the condensate that produced the skin cancer on the backs of certain mice that were painted in these experiments?

A No, I don't.

MR. McANDLE: Would you repeat the question?

(Question was read.)

Q Now, have you also conducted chemical experiments

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with respect to the amount of any polynuclear aromatic hydrocarbons in the condensate from cigars or pipes?

A Yes.

Q And how do they compare with respect to the condensate of cigarette smoke?

A Well, they contain as much per gram of tobacco or maybe a little more than at least the Virginia, straight Virginia cigarette.

Q Now, Doctor, I asked a witness for the plaintiff, whose name was Dr. Kremer, whether it was not the fact that the burning of any organic material will produce the same chemical substances that cigarette smoke does. He answered—

A Excuse me.

Q Well, let me get the page.

A I am sorry. I just didn't hear.

Q Very well. I am sorry.

A My fault.

Q My fault. I asked Dr. Kremer at page 279 as follows:

"I say, isn't it a fact, Dr. Kremer, that burning of any organic materials will produce the same chemical substances that cigarette smoke does?"

And his answer was, "That would be extremely unlikely and against all rules of chemistry, Mr. Haas."

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And I ask you this same statement, sir. Isn't it the fact that the burning of any organic material will produce the same chemical substances as cigarette smoke does?

A Well, I would say that Dr. Kremer and I didn't study out of the same chemical book or chemical text, because I would have to answer that question in the direct contrary, that is to say that they are the same.

MR. HAAS: I have no further questions.

MR. HOOD: Wait a minute. Just a minute.

THE COURT: I think before Mr. McArdle starts his cross examination, perhaps we better take a five minute recess.

(Recess had.)

MR. McARDLE: Any further direct?

MR. HAAS: No, Mr. McArdle.

CROSS EXAMINATION.

BY MR. McARDLE:

Q Doctor, from the substance of what I listened to in your direct examination and your reference to benzpyrene, 3:4 benzpyrene, you and Wynder and others at Sloan-Kettering identified the presence of 3:4 benzpyrene in the condensate of tobacco smoke, the so-called tobacco tar, as one known carcinogen, as you qualified it, carcinogen to mouse skin, is that correct?

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A That is correct.

Q But that was only one of the known carcinogens that you and Wynder were able to fractionate, isn't that so, from the tobacco tar?

A That is correct.

Q How many known carcinogens did you and Dr. Wynder and the Sloan-Kettering group identify as being present in tobacco tar, the condensate of tobacco smoke?

A It is still going on. There may be some since I came down here.

Q That's right.

A I would say 10 to 25.

Q Known carcinogens in the tobacco tar?

A Mouse skin carcinogens that had been demonstrated to cause cancers on the backs of mice. Some mild, some not mild.

Q And it is the thought of you, and it is the thought of the animal researchers and the chemists who collaborate with them that the full number of carcinogens is as yet fully determined. There may be yet undiscovered carcinogens in the condensate of tobacco tar?

A Of this there is no doubt. CX

Q There is no doubt of that.

Doctor, when we speak of a smoking machine, it is true, is it not, that these smoking machines are constructed

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for the purpose of attempting to emulate as much as possible the amount of smoke that a human would consume into his lungs or dram into his lungs as far as mechanical abilities are able to do so? That is the purpose of it.

A It goes a little farther than that, but so far as you carried that, I would say yes.

Q And would you tell us how much further than what I carried it it would go?

A Well, one has to worry about the rate at which it is generated in the cigarette and the rate at which it is taken into the body or that model which we tried to make to simulate the body.

Q Am I correct that the quantum or the potency of a carcinogen to mouse skin is determined by the degree of combustion, the degree of heat at the time that the smoke is drawn into the machine, or in the human, into the lung?

Is that a fair statement?

A Two years ago, I would have answered you yes. Today I cannot answer yes to that question.

Q What changed your position?

A More experimental work.

Q You think that the degree of combustion has no bearing upon the potency of the carcinogen?

A I would not say that, sir. I would say that we are much less sure of it or sure of the way in which it is

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responsible than we were several years ago.

In other words, the farther we go, the less we know in some instances.

Q Doctor, when did you become a consultant of the Canadian Tobacco Institute?

A Well, I was never a consultant of the Canadian Tobacco Institute. There is no such thing.

Q Well, what is it that -- I may not have been listening as attentively as I should.

A The Canadian Cancer Institute, which is a body and part of the Canadian Cancer Association, is a body that gives grants for research in subjects pertaining to cancer.

Q Well, is that similar to our American Cancer Society?

A Exactly, sir.

Q But did I not understand that you were connected with the Canadian Tobacco Company?

A With the Imperial Tobacco Company. They elected to set up a laboratory, research laboratory, or I ought better to say expand the laboratory that they had, and they asked me if I would serve as consultant.

I have been doing that for about two years.

Q That would be since about '58?

A Yes, sir.

Q How long had that been in existence before you

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became its consultant in '58?

A Oh, I imagine that the Imperial Tobacco Company has been doing research for 20 years, 30 years, perhaps.

Q In connection with the cancer producing potential of cigarette condensate?

A No.

Q Well, is that one of the features of their examination and study?

A Not especially, although they are interested in anything pertaining to tobacco.

Certainly, I think there is no doubt that one of the reasons I was invited to participate was my knowledge of the separation of tobacco smoke condensate.

Q And, Doctor, I don't think I am being facetious when I ask this question, although I think it may sound that way, but seriously, these experiments that the scientists, groups that compose, men like Wynder as the doctor and Hoffman as an animal experimenter --

A Chemist.

Q -- chemist, and you as a chemist, when you form a team and begin to apply tobacco tar to the skin of mice, you were not interested in curing mice of cancer. You were interested in finding out whether tobacco tar can cause cancer in human beings. Isn't that the purpose of your testing at the Sloan-Kettering Institute?

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A A mouse is our experimental testing unit.

Q And if you were to test something that would create a cancer in a mouse, then you will consider that that carcinogen to a mouse may be carcinogenic to a human being?

A Or it may not be. It has no connection in sofar as that experiment is concerned.

Your remark was not facetious before, but it may be now.

Q Well, let me see if you and I are not on a common ground:

You have written on this matter, and your writings -- the book I am looking at is borrowed from the Pittsburgh Academy of Medicine, which is part of our medical center, and it is a copy of the article by Wynder and Wright -- and you are the Wright that is referred to?

A Correct.

Q Entitled, "Tobacco Carcinogenesis, 1. Primary fractions," do you recall that article, Doctor?

A Yes, sir.

MR. EMAS: What is the date of that? May we have it?

MR. McARUS: From the section of epidemiology, division of preventive medicine, Sloan-Kettering Institute for cancer research, and the date is October 11, 1956.

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BY MR. McANDLE:

Q You had written on other aspects before that date, had you not, Doctor?

A Yes.

Q Now, the theory of the Sloan-Kettering group of scientists, of which Wynder and Wright were two of the prominent members --

A Correction, sir. I am connected with the University of Toronto.

Q Here, I said.

A No, I never was connected with Sloan-Kettering. I am an independent research man at the University of Toronto.

Q Did you work at the Sloan-Kettering Institute to establish --

A Never. The head of that article should have said Sloan-Kettering Institute and the University of Toronto.

Q Well, it may have at that, although not at the top. I am looking at the bottom now.

Yes, in the section of epidemiology, division of preventive medicine, Sloan-Kettering Institute for Cancer Research, New York, New York, and the University of Toronto, Toronto, Canada. This study has been supported by a grant from the American Cancer Society, Incorporated. Professor Wright --

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A It would be nice if Wynder would have remembered and also put the Canadian Cancer Institute down there, but I guess we let some of those slips go by.

We have never --

Q Do I detect a feeling between you and Wynder?

A None whatsoever. But I want to make it clear that I haven't received any funds from the American Cancer Society.

In point of fact, the laws of the United States prevent them from giving me funds, although they wished at one time to do so.

Q Well, let me ask you whether the Canadian Cancer Society supported this study also?

A That is correct.

Q At least in this little room in this little part of American, we will give the Canadian Cancer Society due credit.

A Thank you.

Q Now, it was the conclusion that was reached by you and Dr. Wynder that animal experimentation in itself was not conclusive, but it was important as an adjunct to the epidemiological studies that were then, or prior to that date been with some consistency connecting cancer of the epidermoid type in the lung with tobacco smoke; isn't that so?

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MR. HAAS: May we have the question read back, please?

(Question read.)

MR. HAAS: Would you mind quoting the article, Mr. McArdle? I don't find that in the article.

MR. McARDLE: I haven't been quoting the article. I have been asking preliminarily if that was not a conclusion that you were reaching in this article.

I can ask it to you directly:

BY MR. McARDLE:

Q It was your thought when you co-authored this article that the epidemiological surveys that had then been in existence had with some degree of consistency established that there was a relationship between heavy cigarette smoking and epidermoid cancer of the lung; isn't that so?

A That's true.

Q And the animal experimentation was not to prove the fact, but to be a corrolary of the epidemiological study and conclusion, wasn't it?

A It was to be an attempt to find a corrolary.

Q Well, let me read what you said. The question on page 271 of this book, a reprint of the article from Cancer Magazine, March-April, 1957:

"The question remains as to what bearing, if any, experimental research in cancer has on the human cancer prob-

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lem. As stated, the proof that smoking represents a cause of cancer in man rests upon epidemiological evidence. Experimental research at present can only define mechanism and identify specific agents for a given animal. This truism applies to all phases of cancer research and, in fact, to medicine in general. Upon having identified specific agents in tobacco tar as they apply to a given experimental animal, one can only proceed as though these agents were also active for man."

If I can interrupt the reading, that means as I understand it, that if you identify a carcinogen in cigarette tobacco condensate or tar, and thm that is a specific carcinogen to a mouse's skin, then one can only proceed as though that carcinogen were also an active carcinogen for man; isn't that what that sentence means?

A No, I don't think it does. I don't think it does mean that. For one thing, we are talking about -- although it doesn't say there, it's implied, just as you are implying, and I understand what you mean when you say carcinogen, you mean it is a carcinogen to a mouse's skin.

Q That's right.

A So that I suppose the next step would be to demonstrate the human skin carcinogenicity. But certainly in no wise would I think that what is written there could be extrapolated to form mouse skin carcinogenicity to human

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lung carcinogenicity.

Q Well, that's what you were discussing, you were discussing the human cancer problem generally, weren't you?

A We were discussing this, yes, because this is the -- in citing matter behind the research.

Q Now, let's read that again:

"Upon having identified specific agents in tobacco tar as they apply to a given experimental animal, one can only proceed as though these agents were also active for man."

Now, does that not mean, as I think it says, Doctor, that if you find a carcinogen that is active for a mouse, you must proceed as though that carcinogen were active for a man?

A I think you are quite wrong, sir. I think all this indicates is an epidemiological study of benzpyrene or the like on the skin of man.

Q Well, that's active for man, isn't it?

A Then we will have to have another epidemiological study, I guess, and I don't think this has been carried out.

Q Speaking of the fact that when you have discovered an active carcinogen that's active for mice, that you wrote in 1956 was that you can proceed only on the assumption that that is also an active carcinogen for man?

A This is quite true, and carrying it to its logical

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basis, this looks as if we should proceed to an epidemiological study on the skin of man.

Q That isn't what you said two years before the Imperial Tobacco --

A Maybe you better read it again, sir.

Q Let me continue, in 1956, "If an agent is found to be carcinogenic to a variety of animals, and if the human epidemiological data are not inconsistent with this finding, then the burden of proof lies upon those who claim that these substances are not carcinogenic to man."

That is true, isn't it?

A I think so, and I guess we will have to find out whether man's skin will develop cancer if we put these substances on it.

Q Why limit it to skin?

A Because the experiment, so far as it goes -- and this is the limit of mine, I don't know of other animals, I have not done any work on the lungs of mice -- so far as my work is concerned, it concerns the cancers on the skin of mice.

I don't like to be sticky about this, but this is a scientific way of looking at it.

Q Doctor, that wasn't your thought at all before you met up with the Imperial Tobacco Company of Canada; is that right?

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A Are you certain about this? Did you hear me talking about this out in Detroit in 1956? If you didn't, you have no right to make that statement.

Q I read what you wrote in 1956. This is what you put in the books, or what is put in the books as a reprint from a magazine that is dedicated to the study and the defeat of cancer.

A And it says exactly what I intended it to say, and what I have said it says here.

Q Now, Doctor, what part of the human anatomy in cigarette smoking is insulted by the cigarette tar, the skin or the lungs?

A Well, it starts with the skin, I suppose, and gets to the bottom of the lung.

Q Well, now, Doctor, let's not--

A We are not being facetious. Dr. Wynder and I have considered everything from the lips down to the alveoli.

Q But the big increase that you gentlemen discovered in your study of cancer and its problem and its relationship with cigarette smoking had been that there was a correlary rise between the consumption of cigarettes by the American male and the increase in lung cancer?

A I would point out that I am not an epidemiologist, and not a physiologist.

Q But you studied that, you discussed it, didn't you,

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and you knew that was a fact?

A I have taken the epidemiological information as something to work from.

Q And that is true, epidemiologically speaking, that there was a correlated rise between cigarette smoking and this amazing increase in the incidence of cancer of the lung in the American male; isn't that true?

A I am very reluctant to give any statement about epidemiology, because there are degrees of meaning that attach to these things.

Q Well, Doctor, the epidemiological studies have been before this particular Jury for a month.

A Well --

Q Just this morning or yesterday Dr. Flipse, I think, testified -- were you here then?

A Yes.

Q You heard him testify that there were 25 epidemiological surveys, most of which corroborated the position that there was a relationship between cigarette consumption and epidermoid cancer of the lung; you heard that?

A Yes, but I didn't hear how many of these were positive and how many of them were negative, nor does my knowledge of the literature on this enable me to answer.

Q If you listened, you would have heard Dr. Flipse say all but three were corroborated.

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A It would be a strange series of scientific investigations that could be classified as three blacks and the rest whites. I don't know of this kind of scientific literature.

Q Doctor, let's give you something better than that.

A All right.

Q Let's give you the Horn-Hammond study, the prospective study, where there was, I think, 98 per cent black and 2 whites.

MR. HAAS: If Your Honor please, I object to this line of inquiry. The Doctor made it plain on his direct examination that he is not an epidemiologist. He does not hold himself out as an expert in that field, or statistics. He is a chemist who worked with Dr. Wynder who happened to be an epidemiologist.

THE COURT: I think that's right, Mr. McArdle.

MR. HAAS: Dr. Wynder has not yet appeared in this court.

MR. McARDLE: The witness, if the Court please, has testified he has studied the epidemiological surveys and is familiar with them.

BY MR. McARDLE:

Q Am I incorrectly stating your knowledge of the epidemiological studies?

A I would think you would be, sir. I obviously

RC-600015 17

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have talked with Hammond, and I have talked with Horn and all these people. I have tried to inform myself sufficiently that there was justification for the chemical work that I was doing.

Q Of course.

A But I can evaluate chemical work, and I can say this experimental work in chemistry is right or is wrong. But I don't know enough about the discipline called epidemiology to look at it and say whether it is right or wrong. I presume it takes years of study to be able to do that and enable me to give the kind of answer you want me to give now.

I would like to do it, but I don't feel that I can.

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Q Doctor, you gave that answer in 1956, didn't you?

A I was a co-author, -

Q Epidemiological study?

A - with a man who wrote this part of the paper. He obviously collaborated with me and he gave his part and I gave my part. I have no reason, no strong reason to say, "Ernie, don't put this in," just as he had no strong reason to tell me not to put the chemical information in. It may be because both of us were ignorant of the other's field to this extent, so far as the true discipline of those things are concerned. Maybe I can help you if you word it some other way but I hate to be held out as a person outside my discipline.

Q Doctor, you are not withdrawing your approval of the 1956 article which bears your name as a co-author, are you?

A I would say that any piece of the publication that I have made is good as of the date at which it is printed, and if I didn't, I certainly wouldn't be a proper scientist.

Q Well then, do you change or will you now assert that you have changed your position in connection with the matter that I read to you since 1956?

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A Well, it hasn't concerned me because the hopes that we had in 1956 about the accumulating of enough information about polynuclear aromatics to account for the mouse skin carcinogenicity have not materialized, so that I haven't had to come to the quandary that you mentioned. You see, they haven't come to this - excuse me.

Q I noted that your testimony, that you spoke of studying the testimony of Dr. David Kendall. I assume, which is quite proper, you were given the transcript of his testimony in which he appeared for the plaintiff in the remote past when this case was early?

A Yes, I wasn't here.

Q Doctor, regardless of your agreement or disagreement with his methods of reaching a conclusion, the point of the fact is he identified ths eight carcinogens that were identified by you and Wynder as being present in tobacco tar. Wasn't that in his testimony?

A That was in his testimony.

Q So that regardless of whether or not you agree with the route he took, you and he and Wynder reached the same ending of your travels, you identified

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the same carcinegens, isn't that correct?

A Well, I suppose a thousand other people could say they did too, but this would not constitute the fact that the other hundred thousand had identified it.

Q Let me ask you this -

A I assume Dr. Kendall was pretty certain they were there after we had found them.

Q Well, it is your belief not that Dr. Kendall was wrong when he told this jury what the eight carcinogens that had been identified were, but he was wrong when he said he had any part in identifying?

A Yes, he probably might have been better to have listened to me.

Q Well, I think the trouble is in waiting to listen for you is determining in what year to listen to you. If he listened to you in '56, we would be hopelessly confused if we expected to know what you were to testify to in '60?

A And the same thing applies to Dr. Kendall.

Q Have you written anything about the work you have been doing since '58 with the Imperial Tobacco Company of Canada?

A No.

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Q Have you been fractionating the cigarette smoke or cigarette tar up in your laboratory at the University of Toronto?

A Yes. That is not for the Imperial Tobacco Company. I have been doing that in connection with my work for the National Cancer Institute.

Q But the Imperial Tobacco Company is running somewhat of a parallel research, are they not, in their own laboratories to which you are a consultant?

A I don't think it's really proper for me to answer that. I don't think they would mind, yes. It's not something -

Q You would prefer that we don't ask as to what the Imperial Tobacco Company is finding, but you have no hesitancy in our asking what you are finding in the Toronto University laboratory, is that a fair statement?

A I am the master at the Toronto Laboratory and I can say what I please about that. I tell you all I do.

Q Are you experimenting with animals up there?

A No, Dr. Gilman is at Toronto Veterinary College. He also holds the National Cancer Institute grant, is doing it.

Q Are you developing myelomas or are you developing cancer on mouse skin at the Veteran's -

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A Veterinary College.

Q At the Veterinary College.

A Yes.

Q Doctor, you are familiar with the fact, of course, that the combustion of coal which creates a coal tar would contain many of the carcinogens that the combustion of cigarette smoke does which contains or creates tobacco tar. That's true, is it not?

A Yes.

Q Well, we don't need to experiment with mouse skin to know that the tar -

A Now, sir, now, sir, you mustn't do that. I let you use the word "carcinogen" understanding you were talking about mouse skin carcinogen.

Q I am using the word "carcinogen".

A I don't want to stop you every time.

Q Based upon the fact that you and Wynder, that it is the burden of proof on those who were contra, that if you find a carcinogen or an agent that is a carcinogen to a mouse skin, anyone who opposes the theory that it is an agent that would create cancer on a human has the burden of proof. That's what you said in '56?

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A The burden of proof to do other studies that are not of this mouse skin nature.

Q All right now, wasn't coal tar a carcinogen to human skin and so discovered in 1775, with the chimney sweeps in London, according to the survey made by Sir Percival Potts, back in that year?

A No, you may think I am quibbling but this wasn't coal tar. This was coal soot.

Q Wasn't coal soot analogous to coal tar?

A Thehas similarities but has -

Q Does it also contain 3,4 benzpyrene as an illustration?

A I certainly can't say about the material in 1775, because there wasn't anybody analyzing for them in those days.

Q Would you expect since they burn soft coal -

A You know, Sir, I would not be sure You see, benzpyrene, if I may explain this, is not too stable a substance and some of these other things are not either. There is a very good possibility there was none up in the parts of the chimney in which those chimney sweeps were working. We have a reason for saying this because we are, of course, looking for other things especially since the polynuclear aromatics have not

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shown themselves to be the sufficient cause of cancer in mice and we are looking for other things and we have ideas that come about out of these soots.

Q Doctor, wasn't it determined, as Dr. Flipse agreed yesterday, that in 1775 and 1776, that the chimney sweeps of London were acquiring cancer in their scrotum from having rubbed into that area of the skin the soot from the chimneys they were sweeping?

MR. HAAS: Just a minute, Doctor. I wonder whether you could cite us the record and page on it. I don't think it conforms with Dr. Flipse's testimony.

Q Let me ask you, ignoring Dr. Flipse, isn't that your understanding that that is the first known incident where cancer was produced on the human skin by the introduction to the human skin of coal soot?

A In so far as my knowledge of the subject is concerned, yes.

Q Yes, and that preceded by 125 years the first time any scientist was successful in growing a papilloma or a cancer on a mouse's ear which was sometime around 1915 from coal tar, isn't that true?

A Yes, I don't see what this means.

Q Well, it means, Doctor, that at least we know when you say you want an epidemiological survey to determine whether or not a carcinogen or an agent which is carcinogenic

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to mouse skin must also first be determined carcinogenic to human skin before we are allowed to consider its carcinogenicity to the human lung. That's what I am attempting to develop.

A That would be all right, just so long as there's no relationship to benzpyrene or the polynuclear-atics.

Q Doctor, you nor Wynder nor none of the epidemiologists or animal experimenters or chemists who have been engaged in this have ever pointed out 3,4 beyzpyrene as being the sole and only agent that could be the cause of carcinogen or cancer in mouse skin when you apply coal tar, isn't that true?

A When we apply tobacco tar.

Q Tobacco tar?

A Tobacco smoke condensate.

Q You mean we are spending a lot of time in this case talking about 3,4 benzpyrene but no scientist has ever said that that is the known carcinogen in tobacco tar that creates the cancer that is created in mouse skin when they apply it to the shaved skin of a mouse? No one has ever -

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A Mr. McArdle, that is why we carried out the 3,000 pound experiment looking for these other things.

Q And you have discovered as many you think as 25 other carcinogens?

A That is true.

Q You may discover many, many more in tobacco smoke?

A But from what we see, the whole bunch that we discover is not going to be sufficient. However, I must qualify to this extent. We have run into another difficulty since this paper was written, although it was suspected at that time, and that is, that animal method can not give a proper evaluation of the effect of the numbers that are present. That's not very clear, I guess. Let us say we have carcinogen A and carcinogen B. Now, in order for the accumulation of these to account for the total mouse skin carcinogenicities of the condensate on the backs of mice, we should be able to take A and B and get half the concentration, - don't let me get too tangled up. We should be able to get the same results, but we don't. In other words, the effect of these things isn't additive and this brings us to an impasse, so far

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as evaluation of the chemical results. In other words, if you please, the chemical results have outrun the tests and we can not get anywhere with them.

Q That's what you have referred to as the carcinogenistic effect?

A No, I would not say ~~carcinogenistic~~. This is something we have looked for. This is the basis of additivity.

Q I don't want to leave that up in the air but I am afraid it will lead me up in the air if I don't ask this question. You don't know, taking all of these known carcinogens that are in tobacco smoke, adding them all together, you don't get the same effect, the total additive of the sum total of these carcinogens than you do when you take coal tar or tobacco tar and apply it?

A That's correct.

Q That's what we mean.

A But further, we haven't any way of figuring out how we are going to do it. This is the impasse. The animal experimentation has not kept up with it. Wynder and I knew this in '56 and that's why I was looking for what I might call the super carcinogen in this system and I couldn't find it.

RC-6000528

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Q That's what happened when that fellow down in South America, Roffo, first anncunced he had discovered benzpyrene in tobacco tar and put the rest of you men to work.

A Well, I don't think we took the Roffo thing very seriously. Obviously at the time, I wasn't interested in it, but in retrospect, looking at it, it wasn't a very good study.

Q It was a marvelous study, it alerted the chemist and the epidemiologist and researchers into studying tobacco smoke can create or does contain known carcinogens?

A I don't think it did that. It was a follow-up of the work on petroleum hydrocarbons, actually.

Q The chromatography that you demonstrated to the jury, that's not a new technique, that's a very old technique in chemistry, is it not?

A Well, I started it and I think I started it about as soon as anybody else in about 1938 or '39. I remember my first columns back at that time.

Q I mean 1940, it was being used with 3,4 benzpyrene, was it?

RC-6000529

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A Yes, that is true. Actually by Reaser.

Q And by Chalmers, Peacock?

A It was a technique that we were using at that time.

Q And the flucresoent spectroscopy treatment was used by Kennaway in '50, was it?

A No.

Q '30, 1930?

A No. No, you see, it so happens that the polynuclear aromatics are flucrescent. Of course, this doesn't limit it because a myriad of compounds are flucrescent, but it enables one to follow these down the column. You will take an ultraviolet light and shine it and this is one of the reasons for using glass and you will see where these zones or bands are and this tells you how to get it off.

Q That's a picture of it, Doctor, isn't it?

A Gee, I wouldn't know what that was.

Q It doesn't matter whether it's benzpyrene, but it is a column and it's chromatography?

A Yes, but this is not what we are talking about spectroscopy.

RL-6000530

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Q No, you have attempted to show on this blackboard by that drawing the various columns, the various levels, showing the different chemical, isn't that about it?

A I guess so. It could be this. I didn't study, to tell you the truth I don't know what this picture is. It could very well be, although it's not very well banded.

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EM:14

Q Well, it is a column or photograph of a Sloan-Kettering column, but if it isn't clear to you, we won't offer it.

A It is not a very good column. Cars are much sharper than that.

Q I believe that, Doctor. You mean the ones at Toronto?

A Yes.

Q Do you agree with Wynder's figures or are you familiar with Wynder's figures as published on the amount of the carcinogens in each cigarette?

MR. HAAS: Now, I object.

Q Was that study made while you were with Dr. Wynder?

MR. HAAS: Just a minute, Mr. McArdle. I object to the form of the question. There is nothing in evidence indicating that Dr. Wynder has any such figures or, indeed, is qualified to state what they are. He is an epidemiologist.

THE COURT: That's right.

MR. McARDLE: I don't know who has qualified him as an epidemiologist, Your Honor.

MR. HAAS: You did, Mr. McArdle, when you listed him as a witness.

MR. McARDLE: He is a specialist in epidemiology. It is true he is also an MD. He is also an animal experimenter.

RL-6000532

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BY MR. McARDLE:

Q Well, maybe you could tell us. You worked with him. Do you know how Wynder --

THE WITNESS: Do I have the Court's permission?

Q Do you know how Wynder reached his figures on the quantum of carcinogenic materials in each cigarette?

THE WITNESS: Do I have the Court's permission?

THE COURT: Yes, sir, certainly. There is no objection to this.

A Well, I think that he has finally arrived to a degree with the numbers that we have reported now, and, incidentally, which is one of the numbers that Wynder and I reported back in the middle '50's.

In this connection I must say that Dr. Hoffman is much to be praised and admired for his contribution in the use of radio-active benzpyrene, which really makes this an exact number at the present time. That is to say for benz-pyrene.

Is he listening to me?

MR. McARDLE: That is all, Doctor.

REDIRECT EXAMINATION

BY MR. HAAS:

Q Doctor, could I ask you one question, please?

Regardless of the name to be given the various hydrocarbons which to date have been identified, to your

RC-6000533

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knowledge, in tobaccco smoke condensate, is it not the fact, they are minimal or merely trace amounts?

A Well, certainly, with the difficulty of getting them out, I would call them minimal or trace amounts, yes.

MR. HAAS: Nothing further.

REDIRECT EXAMINATION

BY MR. McARDLE:

Q Well, Doctor, they may be minimal per cigarette, but for someone smoking 20 to 30 to 40 to 50 cigarettes a day and retaining some of this particulate in his lung, the total accumulation wouldn't be minimal, would it?

A I don't think he is accumulating all of it.

MR. HAAS: Just a minute, Doctor. I object to the form of the question on the grounds that it assumes a fact that is not in evidence, and that is the extent to which any of these things are retained in the lung.

MR. McARDLE: It has been testified to by our side early in this case. Dr. Overholt —

MR. HAAS: Dr. Overholt's deposition took into account ciliary reaction, mucus reaction, coughs and all sorts of things which you are not accounting for now —

THE COURT: That's right.

MR. HAAS:— in the deposition he gave. Remember?

MR. McARDLE: I think Dr. Haenitz said 80 per cent.

MR. HAAS: Will you point to the record reference,

RC-60005 34

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Mr. McArdle? We will have an argument about it.

MR. McARDLE: I don't think we have to go into it.

BY MR. McARDLE:

Q You are not qualified anyway, Doctor, I take it, to talk about the physiological effect on the lung or what is retained, since you are a chemist, not an MD?

A I don't think so. That's right.

MR. McARDLE: Since it is a habit that each lawyer wants to ask the last question, maybe that is why I ask it. That is all.

MR. HAAS: I concede it to you, Jim.

MR. REED: We are going to call a witness who will be quite long, but I can get through the qualifications, if you wish.

THE COURT: Well, we can just take that phase of it. We will hear another witness.

MR. REED: Yes. Dr. Kensler.

- - -

DR. CHARLES J. KENSLER, a witness in behalf of the defendant, having been first duly sworn, testified as follows:

THE CLERK: And your full name, sir?

THE WITNESS: Charles J. Kensler.

DIRECT EXAMINATION

BY MR. REED:

Q State your name, please.

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